

MERRITT



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Cape Cod Community College

Summary of Current Waste Management and Recycling Program And Recommendations for Increasing Diversion

Prepared for:

The Executive Office of Environmental Affairs

By:

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June 2003**

Project Basis:

The Massachusetts State Sustainability Program of the Executive Office of Environmental Affairs has funded this project. The first project goal is to examine solid waste and recycling efforts at college and university campuses throughout the State, with respect to meeting the recycling goals waste bans promulgated by MA DEP. Based upon that review, proposals are made for incremental improvement in waste management and recycling practices to increase diversion of materials and reduce disposal in a most cost-effective fashion.

For additional information on the State Sustainability program please contact:

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Cape Cod Community College:

Cape Cod Community College (CCCC) in West Barnstable, Massachusetts strives to be a “Green” school by implementing many environmental initiatives including: hybrid vehicles, wind towers, solar panels, and biodegradable cutlery in cafeteria. With respect to this project’s focus, a well-developed and monitored recycling program is also in place. Add to that the highly motivated staff and volunteers and CCCC represents an excellent role model for other Massachusetts campuses wishing to become more sustainable. It is possible that the greatest over-all recycling benefit at other schools could come from learning about the approach adopted at CCCC.

Summary of Key Recommendations:

1. Increase the size of the five 8 cu. Yd. general waste containers to 10 cu. yd containers.
2. Reduce collection of the five 10 cu. Yd. general waste containers from three times a week or 256 times per year to twice a week or 204 times per year, making sure that the containers are about 90% full, rather than the currently estimated 75% full.
3. Increase the estimated percentage full of commingled toters when collected from 75% to 90% by increasing outreach and educational efforts regarding commingled diversion.

Summary of Predicted Program Benefits:

1. Commingled tonnage diverted is estimated to increase by about 20% from 6.68 tons to a little over 8 tons.
2. The same total waste amount of about 280 tons will be managed while saving an estimated \$10,000 by using 25% larger containers, collected at an

estimated 90% full rather than the currently estimated 75% full, twice a week instead of three times a week.

Solid Waste Management Practices:

Waste Management and Recycling Vendor:

Waste Management Inc. (WMI)
Contact: (800) 331-5620

Contract Start date 07/01/2000
Contract End date 06/30/2002 with two two-year options to renew. The total anticipated duration is up to 6 years.

Equipment, Collection Schedule and Contract costs:

MSW- Five 8 yd dumpsters collected 3x/wk

Lump sum MSW collection costs: \$24,750/year

Recycling,

Materials Recycled: Mixed paper, OCC, commingled materials (1-7 plastics, metal, glass), food waste/organics generated in cafeteria, kitchen, dining hall, and green spaces

Paper: Mixed and OCC collected together (6% contamination allowable). Four -8 cu. Yd bins located behind Science Bldg, cafeteria, library, & maintenance warehouse, 14 gallon curbside containers (use deskside and other locales with significant paper generation, e.g., computer labs, administration building and other office corridors, copy center, bookstore, and Main Sheet (campus newspaper office). Maintenance staff ("maintainer") uses plastic hampers or wheeled toters to collect paper deskside. Paper put into plastic bags which are delivered to a Facilities owned stake body truck and material is transported to centralized dumpsters for collection by contractor. One maintainer is assigned to each building. Collection frequency from buildings: as needed. Collection frequency of outdoor paper dumpsters: 2x/mo.

Lump sum OCC/mixed paper recycling collection costs: four 8 cu. yd 2 x/mo - \$4,300
Price per extra pickup per container: \$20.00

Commingled materials (glass, metal and plastic): Recycling stations (consisting of two 25 gal recycling bins [one refundables, one non-refundables] and one trash bin) placed at both ends of all hallways in each building to be emptied into 8 total 95 gal toters located outside cafeteria, South Bldg and library. There are approximately 50 recycling stations (for commingled containers) campus wide totaling 100 recycling bins.

Building “maintainers” responsible for non-refundable recyclables – emptied as needed – generally on a weekly basis. Environmental intern responsible for weekly collection and redemption of “refundables”.

Lump sum glass, plastic, metal recycling collection costs: \$1,650 per year

Organic waste - Yard waste is mulched on site

- Food waste: Collected in 1-10 cu. Yd. container, collected 5x/week (when school is in session and cafeteria is operating). Workers place materials in five 65-gallon totes (behind kitchen) paper products, bio cutlery is delivered to Watts Family Farm in Forestdale, MA which is a Massachusetts DEP licensed compost facility. The compost materials are sold to both public and private contractors. Compost program was established in Spring 2002 funded by a DEP grant.

Volume recycled- It is estimated that approximately 600 lbs/week of organic waste is delivered from CCCC to the compost facility.

Cost- \$400/mo (= approx \$45/ton)

Additional materials recycled:

- C&D waste (clean and dirty wood) delivered to Barnstable transfer station
- Fluorescent bulbs (vendor- Global Recycling, AERC Recycling Solutions), have bulb crusher – cuts costs
- Computer monitors collected by Triumvirate Environmental
- Batteries collected by Triumvirate
- Tires collected by Triumvirate
- Printer cartridges donated to charitable organizations

Contract Evaluation:

Waste Management (WMI) is the waste management and recycling vendor. The contract is based upon lump sum pricing with scheduled collections for all containers. Lump sum pricing with no weight records for any materials creates circumstances wherein it is impossible to determine current disposal or recycling rates. While the effort to maximize paper diversion and include commingled recycling is a very aggressive program, there is no basis for accurately assessing current rates or measuring improvement. This is a weak point. However good the program is today, there should continue to be an interest in finding improvements. The staff at CCCC clearly expresses that interest. Having unit prices for disposal and container services, as well as accurate quantity/weight records for material flow, is an important tool in accomplishing that.

In the absence of any actual volume or weight data, estimating that all waste and recycling containers are 75% full when collected, the base case shows that Cape Cod

Community College recycles about 162 tons annually; 4 tons per year of commingled containers and 158 tons per year of paper mix including OCC. This assumption results in an un-supportable recycling rate of 37% overall and rates of over 35% and 0.9% for paper and commingled containers respectively. Based on recent research, paper and commingled represent about 31%¹ and 4.4%² respectively, of the pre-recycling educational institution waste stream. So, again, based on estimates in the absence of unit-based data, CCCC cannot determine actual percentage rates. In this model, the recycling rate for paper is higher than that estimated in the waste stream. This does not mean that recycling rates are not good, they probably are higher than at most schools. However, in the current contract arrangement, it is impossible to know the actual rates. Clearly, whatever the assumptions, there is ample additional commingled containers that can be diverted.

However, to improve upon these unreliable estimates, it is important to institute unit measurement and some review of remaining capacity that may be in some containers collected on a schedule, rather than on an “on-call” basis.

The first step necessary for CCCC is establishing waste management and recycling services agreements that offer unit based pricing and clear reporting of material generation and management data. In addition, an on-call collection basis, rather than scheduled, may allow some reduction in collections necessary or the use of smaller containers. This should result in a reduction in fees.

Since Waste Management is already one of 35 solid waste services vendors, qualified as contractors under Mass OSD’s statewide contract (ST1J391) for waste removal and recycling services, it should be possible for a switch to “on-call” services. Contract ST1J391 requirement #11 requires that: *All contractors must agree to **reduce collection frequency at department facilities at any time during the agreement period should a facility request such a reduction as a result of greater recycling and/or waste prevention activities. Such reductions in collections should result in associated reductions in price.*** It is possible that an on-call collection system would be more cost-effective.

Even if a lump-sum fee arrangement should continue, if the school receives accurate reports on quantities managed, a reasonable calculation of per ton costs can be established and tracked through potential future changes. Once again, OSD’s contract, ST1J391 would provide a solution. Requirement #10 requires that: *Contractors must submit **semi-annual statewide reports** to the PMT and must submit individual facility reports upon request which details the quantity of materials disposed of and/or recycled during the previous 6 months.* Since the contracts language does not specify that “weight”

¹ **Advancing Resource Management at Fitchburg State College**

(Fitchburg, MA), Tellus Institute for Mass. DEP, January 2002; cites: By weight (before recycling), based on waste stream profiling performed by Harvard University in 2000 and supported by California Integrated Waste Management Board Waste Composition study <http://www.ciwmb.ca.gov/WasteChar/BizGrpCp.asp> - educational institution data.

² California Integrated Waste Management Board Waste Composition study

<http://www.ciwmb.ca.gov/WasteChar/BizGrpCp.asp> - educational institution data; aggregating clear and brown glass (1.3%), aluminum (0.2%), tin/steel (1.8%), HDPE (0.3%) and PETE (0.8%) containers =

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be provide, volumes may be the only measure of quantity available. However, if the “on-call” collection approach were adopted and containers were a known percentage full when hauled, reasonable weight estimates can be made from industry volume to weight conversions. If weight slips could actually be negotiated with the vendor, that would be the ideal circumstance.

In any event, the total cost for the recycling program is \$5,950, resulting in an average recycling cost of about \$36/ton. The total annual costs for paper alone and commingled containers alone are \$4,300 and \$1,650 respectively. This results in per ton expense of \$27.23 for paper recycling and \$247 for commingled container recycling. Clearly, if these estimates are even close, commingled recycling is currently expensive, while paper rates are pretty good.

With respect to solid waste, CCCC disposes about 280 tons, collected in five 8-cu. Yd. open top containers, hauled three times each week. The total cost for solid waste collection and disposal is \$24,750, resulting in a per ton cost of \$88.14 for collection and disposal of solid waste. Again, understanding that much better real data is required before estimates have a real basis, this is indicating a very favorable relationship between the cost of recycling and waste management, with recycling only costing about half as much as waste collection and disposal.

Recommendations to Upgrade Recycling Program:

Overview:

CCCC’s student population commutes to school. Many of the students are older with a family and often one or more jobs who attend school on a part time basis. They often arrive for their class and leave immediately afterwards, not engaging in extra curricular activities or campus life. This makes communication with the student body challenging. Thus better promotion of existing program to increase diversion rates is needed.

Among the recommendations below are several directly intended to get out the word about CCCC’s exemplary efforts. CCCC’s strong environmental and sustainability ethic can serve as a model for other Massachusetts campuses. The Director of Facilities is a strong advocate for recycling and other environmental initiatives on campus. This is unusual, so his enthusiasm should be leveraged to promote the case for recycling to other college facilities directors.

Recommendations include:

Solid Waste:

- Increasing the five waste collection containers from 8 cu. yds. to 10 cu. yds.
- Reducing waste container collection from three times a week to twice, while making sure that containers are at least 90% full when collected.

- Change existing waste management and recycling services agreement to add some element of unit based tracking, by price and material if possible, but at least by material quantities managed per period. Until better data is available, it is not possible to even propose a hypothetical case for incremental program improvement. However, with the estimated better than 2-1 price ratio of disposal to recycling, when better material volume data is available, there should be clear cases that can be made for improvement.
- Review current remaining capacity, if any, of containers prior to currently scheduled collections and consider on-call or reduced collection schedules for reduced fees. Institute baseline monitoring system of MSW collection to try to ascertain estimates of volume of MSW collected. Contractor does not provide this information as dumpsters are emptied into a truck with other loads of materials from other locales. Baseline estimates can be calculated using percent full of containers, container volume and industry rules of thumb for volume to weight conversion. There are student volunteers at CCCC who could be recruited for this task. It is important to know how much MSW is generated to fully evaluate and make comparisons of MSW collection costs. For instance, if the containers are typically less than 75% full when collected, CCCC should consider switching to an on call arrangement with their vendor to ensure maximum cost efficiency.

Recycling:

- Increased outreach to elevate diversion of commingled containers by about 20% resulting in toters that are estimated to be 90% full rather than the currently estimated 75% full,
- Focus campus educational outreach, signage etc. on commingled containers and consider increasing commingled capacity and/or collection frequency.
- More paper collection containers in pubic locales. The staff on campus feels that there are several locations on campus where a high degree of paper generation take place which are lacking recycling containers. This would be a good project for a student intern or work-study student who could monitor trash receptacles to identify new locations to put recycling containers. Trailing the maintainers on their collection rounds is an effective means of getting that information.
- Identify other locations of high material generation and locate bins there. Toters for commingled materials could be placed in the cafeteria kitchen for the collection of food preparation waste (steel cans, glass and plastic jars, etc.). This will require the cooperation of the food service management and training of the food service staff to ensure that containers are clean and contaminant free.
- CCCC's food concession was up for bid in Jul 03 and will be in subsequent future years. This contract should be rewritten as to maximize food and recyclables diversion from the food preparation and seating areas of the cafeteria and to require the food service personnel to participate in recycling programs. This should include recycling and use of biodegradable and recyclable materials for campus events.
- Make detailed case study on CCCC's MSW and recycling collection program available to other campuses. Use data and information from this summary as

starting point. Arrange site visits for other campus planners to CCCC conducted by CCCC's Facilities Director and other involved staff.

- Develop system of student volunteers to monitor: levels of contamination, container signage problems, fullness of containers, missing or damaged equipment, etc. CCCC has Community Service Initiative program where students could be recruited to assist with recycling program.
- Supplemental promotion needs to be undertaken to encourage students and staff to participate in existing recycling program. Potential avenues include: campus wide email system, Mainsheet (campus newsletter), entrepreneurial club, Student senate, Sustainability Club

Spreadsheet Tracking Model

The consultants have developed spreadsheet tracking models to assist the school's planning staff in attaining the optimal cost scenario for their existing or planned recycling and solid waste management programs. This tool should prove enormously helpful in assisting schools to make the necessary adjustments in targeted materials, containers, vendors, etc., to achieve the highest possible diversion at the lowest possible cost.

The models work as follows:

The tracking model is an Excel workbook, consisting of three primary worksheets, followed by a series that could be employed to address additional expense or revenue items like amortizing purchased equipment or generating an equipment replacement fund. Any additional expense or revenue issues could be added to this model in the future as required.

The first worksheet includes basic data about the existing program and circumstances, such as the rate of inflation, the densities of different materials and the current revenue per ton for recyclable materials. These assumptions can be changed, if necessary, due to changing circumstances over time. In addition, on the first worksheet, there is an extensive input matrix, with each data input item highlighted in yellow.

This matrix provides spaces to profile current or future container and collection schedules for waste and for recyclables. For each container type, there are input spaces for: # of containers, the size, collection schedule and known fees for collection, container leases or disposal, percent full when collected.

For the first year, we have attempted to capture, as accurately as the available data allows, what the current circumstances are for all containers for all materials. This column represents the "base case." The power of the model lies in its capacity to allow "what-if" estimates for future years, by varying any of the input variables highlighted in yellow.

Using the data and assumptions described above, the first worksheet calculates the following:

Total waste collection cost
Total waste disposal cost
Total tons of waste disposed
Total recycling cost
Tons of mixed paper recycled
Tons of OCC recycled
Tons of commingled containers recycled
Total waste and recyclable material generation in tons
Recycling percentage
Annual mixed paper revenue
Annual OCC revenue
Annual commingled revenue

The second worksheet of the model is a Budget Summary pro-forma, which takes data from the assumptions and data sheet and breaks out the financial implications of the base case, as well as any what-if scenarios. In addition to restating the total expenses for waste collection and disposal as well as recycling programs, this worksheet breaks out the cost/ton to manage waste, cost/ton to manage recyclable materials and combined cost/ton for all materials. If revenues are relevant, the revenue stream is also captured. Finally, the annual total for all waste and recycling activities is calculated, as is a three-year total.

Therefore, as container sizes change, collection schedules or fees are changed, the impact on total recycling percentage, cost, cost/ton for waste and recyclables management can be easily seen. This allows the opportunity to establish hypothetical cases and compare the costs and volumes managed to the current base case. As years pass, the model continues to sharpen each current case, while providing more accurate predictions for possible future cases. When each year has passed, comparing actual results to what had been predicted a year or more earlier allows one to easily assess the degree to which performance expectations have been met or where changes may still be needed. In any event, each campus will have a clear and accurate picture of volumes of materials being diverted and disposed, as well as all costs related to those activities.

Finally, the third worksheet is the summary of the current recycling and waste management contract terms at the school.

Environmental and Cost Benefits of Implementing Recommendations:

1. Real progress in improving program will result from accurate data upon which to base comparisons from year to year.

2. An estimated \$10,000 savings in general waste management fees should be possible by adjusting waste container size and collection schedule reduced pick-up and haul charges.
3. An estimated 20% increase in commingled container diversion could result if toters were 90% full rather than the estimated 75% full
4. Base Case - Data interpretation: (***Please refer to Attachment A – Worksheets One & Two***). The current situation or “base case” is reflected in the first column, throughout the model. This column includes all actual annual data available. The total cost of all material management is estimated as \$30,700, found on the second worksheet at the bottom of the budget pro-forma. Also found on this worksheet, are the following average “base case” costs: \$88.14/ton of MSW managed; \$36.04/ton of recyclable materials managed; and \$68.85/ton for all materials managed.
5. Year One of proposed changes - Data interpretation: (***Please refer to Attachment A – Worksheets One & Two***). The first year of proposed changes is reflected in the second column, throughout the model. This column includes: a) increasing commingled container outreach and filling toters to at least 90% before collection, rather than the currently estimated 75%; b) increasing the size of the five containers for MSW from 8 cu. Yds. To 10 cu. and c) reducing MSW container collections from a scheduled 256/year to about 204/year, on an on-call basis. The total cost of all material management is estimated as \$20,700, a reduction from the base case of an estimated \$10,000. Also found on this worksheet, are the following average “Year one” costs: \$52.83/ton of MSW managed (an estimated reduction of over \$35/ton) ; \$35.75/ton of recyclable materials managed; and \$46.45/ton for all materials managed.
6. All additional efforts further the school’s Green Campus campaign.
7. Continued emphasis on organic diversion, where possible, broadens and improves the over-all diversion efforts.
8. Increased commingled diversion, without significant added cost, reduces use of virgin feed stocks.
9. Future steps, if available revenue warrants it, might include segregating paper grades and realizing some revenue return.

Conclusions:

- CCCC is doing a very strong job to date in implementing and improving a campus wide recycling program for paper and commingled containers
- Largest immediate benefit would derive from an improved MSW management contract and disposal oversight, which could be achieved by adopting the Mass OSD statewide waste management contract (ST1J391) with its terms favorable to waste reduction and increased recycling.
- The current waste container size and collection frequency should be reviewed, specifically as with respect to the percent full all containers for all materials managed.
- Commingled container diversion can be improved without significant cost increase.

- The CCCC recycling model should be summarized and made available, through whatever media are available, to other schools interested in increasing the success of their recycling programs.
- Concerns for estimating future circumstances include the relative fees for disposal as time passes. Recent municipal disposal contracts at SEMASS have had fees ranging from \$75 to \$85.